

UNIVERSITY OF TECHNOLOGY, SYDNEY

**MANGROVE ALGAE IN THE  
ASSESSMENT OF ESTUARINE  
POLLUTION**

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**Submitted April, 2005**

## **CERTIFICATE**

I certify that the work in this thesis has not been previously submitted for a degree, nor has it been submitted as part of requirements for a degree except as fully acknowledged within the text.

I also certify that the thesis has been written by me. Any help that I have received in my research work and the preparation of the thesis itself has been acknowledged. In addition, I certify that all information sources and literature used are indicated in the thesis.

A handwritten signature in cursive script, reading "February Michelle". The signature is written in dark ink and is positioned in the lower center of the page.

## ACKNOWLEDGEMENTS

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This project could not have been undertaken without the help of many people. For this help I give my utmost thanks.

Firstly, thank you to my supervisors. Dr Alex Pulkownik, my principal supervisor, continually provided assistance with every aspect of the whole project, particularly in the preparation of this thesis. Alex also assisted with the preparation of seminars, conference presentations and papers for publication, in addition to providing friendly support and I am very grateful for her understanding and help. Thank you to Dr Jenny Stauber who made me feel very welcome at the CSIRO laboratories. Jenny also assisted with the design of the whole project, particularly the microalgal sections, with very helpful advice both in the field and laboratory. I also wish to thank Jenny for her editorial comments during the preparation of this thesis. Associate Professor Richard Lim assisted in the experimental design of this study and providing feedback during the thesis writing process. Professor Meg Burchett also provided help throughout the whole experimental process, particularly with her tireless reading of many thesis drafts. Thank you Meg, for your help during this project and the last few years.

I would also like to thank Edwina Laginestra, and the Sydney Olympic Park Authority for providing generous funding for this project. In addition, Edwina contributed many ideas about the experimental design and the further application of the findings of this study. For the provision of a stipend during the project, I would like to thank the Institute of Water and Environmental Resource Management and the Faculty of Science at the University of Technology, Sydney. Thank you also to the Department of Environmental Sciences at UTS and CSIRO for ongoing financial support of this project.

Thank you to the laboratory staff at the Department of Environmental Sciences, UTS. Narelle Richardson was always a friend, with a great deal of expertise in every laboratory procedure you could think of. Gemma Armstrong has always been there to answer my questions and help with the analyses. I would also like to thank Sue Fenech, whose experience with microalgae made her a very useful laboratory ally. Finally, thank you to my lovely research assistant Janine Wech. Your enthusiasm about even the most routine and laborious tasks was infectious!

A big thank you also to the people at the Centre for Environmental Contaminants Research laboratories at CSIRO. Monique Binet and Merrin Adams were my mentors in the art of microalgal isolation and culturing, toxicity testing and flow cytometry. Thank you to both of you for helping me so much, and making me feel welcome at CSIRO. Thank you also to Gustaaf Hallegraff at the University of Tasmania, for identifying the isolated microalgae to species level.

Finally, I would like to thank the two most important people in my life. My mother, Margaret Melville, for providing emotional and financial support whenever it was needed. Margaret also came with me while I collected samples on several occasions to ensure that I literally did not get stuck in the mud! Last but not least, I wish to thank Ralph Alquezar. Ralph came on every fieldtrip, assisted in much of the labwork, advised on statistical analyses and helped generate the maps for this thesis. Ralph also provided ideas on experimental design and procedures, read thesis drafts and was a wonderful and supportive partner during the whole study.

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## ABSTRACT

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Estuaries are highly degraded ecosystems throughout the world. The primary aim of this study was to investigate the biology and ecology, and the effects of contaminants on mangrove-associated micro and macroalgae, and assess their suitability in the biological assessment of estuaries.

Ecological surveys over two seasonal cycles, in four estuaries in New South Wales, Australia, the Cooks, Parramatta, Hawkesbury and Clyde Rivers, were used to examine the diversity, distribution and abundance of mangrove micro- and macroalgae, their seasonal and spatial variability and the role of sediment and water metal contaminants and nutrients in their distribution and abundance. Species that appeared to be impacted by contaminants were selected for toxicity testing in the laboratory to examine their sensitivity to the common pollutant metal, copper.

Thirty genera of microalgae and eight species of macroalgae were identified in this study. Microalgal diversity and abundance were significantly higher in summer, but no seasonal variation in the macroalgae was demonstrated. Intertidal variation in macroalgal distribution and abundance was evident, with each species growing optimally in different intertidal zones, possibly as a consequence of competition amongst the algae, and desiccation tolerance or intolerance. Variation in macroalgal distribution along the vertical length of pneumatophores was also evident for several species.

Both the micro- and macroalgal diversity differed between the contaminated Cooks and Parramatta Rivers, and the less contaminated Hawkesbury and Clyde Rivers, indicating that contamination was potentially impacting species survival. Distribution of the macroalgae *Catenella nipa*, was negatively correlated with contaminant concentrations indicating its potential as a bioindicator species. *Caloglossa leprieurii* distribution was higher in the more contaminated estuaries, suggesting that it may be a useful biomonitor species.

In laboratory toxicity tests using net photosynthesis as an endpoint, *C. nipa* was sensitive to copper at Australian and New Zealand Water Quality Guideline concentrations, further confirming its potential use as a bioindicator. In growth inhibition tests, microalgal species from the less contaminated Hawkesbury and Clyde Rivers were sensitive to copper at guideline values, indicating that these algae were potentially useful toxicity test species.

In both the micro- and macroalgal toxicity tests, similar species originating from the different estuaries displayed copper EC50 values that appeared to reflect the contaminant concentrations of their site of origin. Thus, adaptation and/or acclimation to contamination by the mangrove algae appeared to be operating.

This study has contributed to a better understanding of the seasonal and spatial factors affecting mangrove-associated algae in south-east Australia, on which there has been previous little research. This study has also identified organisms that could be potentially used in the monitoring and assessment of estuarine contamination, including bioindicator species, a biomonitor and several sensitive laboratory toxicity test species.